

B&ESD Newsletter
July 2011

Pubs and Products

Biswas, A., Brooks, S. C., Miller, C. L., Mosher, J. J., Yin, X. L. and M. M. Drake. 2011. Bacterial growth phase influences methylmercury production by the sulfate-reducing bacterium *Desulfovibrio desulfuricans* ND132. *Sci. Total Environ.* 409: 3943-3948.

Brown, S. D., Guss, A. M., Karpinets, T. V., Parks, J. M., Smolin, N., Yang, S., Land, M. L., Klingeman, D. M., Bhandiwad, A., Rodriguez, M. Jr., Raman, B., Shao, X., Mielenz, J. R., Smith, J. C., Keller, M., and L. R. Lynd. 2011. Mutant alcohol dehydrogenase leads to improved ethanol tolerance in *Clostridium thermocellum*. 2011. *P. Natl. Acad. Sci. USA*. Available online. DOI: 10.1073/pnas.1102444108

Cai, B., Yang, X., Tuskan, G. A., and Z.-M. Cheng. 2011. MicroSyn: A user friendly tool for detection of microsynteny in a gene family. *BMC Bioinformatics* 12: 79.

DeGraaff, M. A., Schadt, C. W., Rula, K., Six, J., Schwietzer, J. A., and A. T. Classen. 2011. Elevated CO₂ and plant species diversity interact to alter root decomposition. *Soil Biol. Biochem.* Available online. DOI: 10.1016/j.soilbio.2011.07.006

Gihring, T. M., Zhang, G., Brandt, C. C., Brooks, S. C., Campbell, J. H., Carroll, S., Criddle, C. S., Green, S. J., Jardine, P., Kostka, J. E., Lowe, K., Mehlhorn, T. L., Overholt, W., Watson, D. B., Yang, Z., Wu, W.-M., and C. W. Schadt. 2011. A limited microbial consortium is responsible for extended bioreduction of uranium in a contaminated aquifer. *Appl. Environ. Microbiol.* 77: 5955-5965.

Gottel, N. R., Castro, H. F., Kerley, M., Yang, Z., Pelletier, D. A., Podar, M., Karpinets, T., Uberbacher, E., Tuskan, G. A., Vilgalys, R., Doktycz, M. J., and C. W. Schadt. 2011. *Populus deltoides* roots harbor distinct microbial communities within the endosphere and rhizosphere across contrasting soil types. *Appl. Environ. Microbiol.* Available online. DOI:10.1128/AEM.05255-11

Jones, C. D., Hughes, J. K., Bellouin, N., Hardiman, S. C., Jones, G. S., Knight, J., Liddicoat, S., O'Connor, F. M., Andres, R. J., Bell, C., Boo, K.-O., Bozzo, A., Butchart, N., Cadule, P., Corbin, K. D., Doutriaux-Boucher, M., Friedlingstein, P., Gornall, J., Gray, L., Halloran, P. R., Hurtt, G., Ingram, W. J., Lamarque, J.-F., Law, R. M., Meinshausen, M., Osprey, S., Palin, E. J., Parsons Chini, L., Raddatz, T., Sanderson, M. G., Sellar, A. A., Schurer, A., Valdes, P., Wood, N., Woodward, S., Yoshioka, M., and M. Zerroukat. 2011. The HadGEM2-ES implementation of CMIP5 centennial simulations. *Geosci. Model Dev.* 4: 543-570.

Marino, G. P., Kaiser, D. P., Gu, L., and R. M. Ricciuto. 2011. Reconstruction of false spring occurrences over the southeastern United States, 1901–2007: an increasing risk of spring freeze damage? *Environ. Res. Lett.* 6 (April-June 2011) 024015.

Norby, R. J. and D. R. Zak. 2011. Ecological Lessons from Free-air CO₂ Enrichment (FACE) Experiments. *Annu. Rev. Ecol. Evol. S.* 42: 181–203.

- Perkins, T. A. and H. I. Jager. 2011. Falling behind: Delayed growth explains life-history variation in Snake River fall Chinook salmon. *T. Am. Fish. Soc.* 140: 959-972.
- Preston, B. L., Danese, C., and E. J. Yuen. 2011. Embedding climate change risk assessment in a governance context. *In Proceedings of the Colorado Conference on Earth System Governance*, Fort Collins, Colorado, U.S.A.
- Pu, Y., Kosa, M., Kalluri U. C., Tuskan, G. A., and A. J. Ragauskas. 2011. Challenges of the utilization of wood polymers: how can they be overcome? *Appl. Microbiol. Biot.* 91: 1525-1536.
- Vargas, R., Baldocchi, D. D., Bahn, M., Hanson, P. J., Hosman, K. P., Kulmala, L., Pumpanen, J. and B. Yang. 2011. On the multi-temporal correlation between photosynthesis and soil CO₂ efflux: reconciling lags and observations. *New Phytol.* 191: 1006-1017.
- Wullschleger, S. D., Childs, K. W., King, A. W., and P. J. Hanson. 2011. A model of heat transfer in sapwood and implications for sap flux density measurements using thermal dissipation probes. *Tree Physiol.* 31: 669-679.
- Yang, X., Tschaplinski, T. J., Hurst, G. B., Jawdy, S., Abraham, P. E., Lankford, P. K., Adams, R. M., Shah, M. B., Hettich, R. L., Lindquist, E., Kalluri, U. C., Gunter, L. E., Pennacchio, C., and G. A. Tuskan. 2011. Discovery and annotation of small proteins using genomics, proteomics, and computational approaches. *Genome Res.* 21: 634-641.
- Yang, X., Ye, C.-Y., Cheng, Z.-M., Tschaplinski, T. J., Wullschleger, S. D., Yin, W., Xia, X., and G. A. Tuskan. 2011. Genomic aspects of research involving polyploid plants," *Plant Cell Tiss. Org.* 104: 387-397.
- Ye, C.-Y., Li, T., Tuskan, G. A., Tschaplinski, T. J., and X. Yang. 2011. Comparative analysis of GT14/GT14-like gene family in *Arabidopsis*, *Oryza*, *Populus*, *Sorghum* and *Vitis*. *Plant Sci.* Available online. DOI: 10.1016/j.plantsci.2011.01.021

Notable Achievements

On June 24th Oak Ridge National Laboratory (ORNL) researchers hosted a discussion meeting at ORNL with visitors from the Joint BioEnergy Institute (JBEI) to discuss potential collaboration between the BioEnergy Science Center (BESC) and JBEI in the area of feedstocks development and characterization. Visitors from JBEI included Dr. Henrik Scheller and Dr. Dominique Loque. Dr. Scheller is the Vice President Feedstocks and Director of Cell Wall Biosynthesis and Dr. Loque is the Director of Cell Wall Engineering at JBEI. Meeting participants also included Breeanna Urbanowicz, Maria Pena, and Debra Mohnen (via conference call) from the University of Georgia. ORNL participants were Jay Chen, Brian Davison, Paul Gilna, Lee Gunter, Sara Jawdy, Udaya Kalluri, Wellington Muchero, Tim Tschaplinski, Jerry Tuskan, and Xiaohan Yang. The meeting participants discussed possible collaboration in the area of plant feedstocks development and characterization between BESC and JBEI. BESC has focused on feedstocks development for two major bioenergy crops, *Populus* and switchgrass, whereas by using the model plants and rice, JBEI has identified some key regulators of cell wall biosynthesis that may potentially be applied to bioenergy crops. While both centers have their strength and have complementary expertise and resources, the meeting participants identified several possible areas of collaboration. These include the use of joint effort to characterize some key genes regulating biomass recalcitrance discovered independently at BESC and JBEI, the potential use of tissue-

specific expression system to manipulate target gene expression in bioenergy crops, and the use of biotechnology platform and biomass characterization pipelines. The meeting participants recognize the importance of interaction and collaboration between Bioenergy Research Centers and expect synergistic outcomes. Communications will be largely conducted via emails and teleconferences, but future face-to-face meetings are also expected.

BESC staff Paul Gilna, Renae Speck, Brian Davison, and Suzy Fowler attended the 2011 BIO International Convention in Washington, D.C., from June 27th-30th and participated in a number of events over the course of the convention, including:

- Brian Davison organized and moderated a BIO session on “Progress of Research in Bioenergy Centers” featuring Paul Gilna (BESC), Tim Donohue (Great Lakes Bioenergy Research Center - GLBRC), Jay Keasling (JBEI) and Heather Youngs (Energy Biosciences Institute - EBI). This session and the roundtable are captured in an article in *Industrial Biotechnology* (Sept. 2011).
- BESC staff participated in a number of one-on-one meetings with dignitaries attending the conference including:
 - Kansas Governor Sam Brownback, Senator Pat Roberts (KS), Pat George, Secretary of Commerce (KS), and Dale Rodman, Secretary of Agriculture (KS).
 - Zach Marshall, Legislative Assistant for Representative Jim Cooper, Tennessee, 5th District.
- Paul Gilna, and the directors of GLBRC and JBEI participated in a series of sessions where they each briefed the Senate Energy and Water Development Appropriations Committee Staff, the House Energy and Water Development Appropriations Committee Staff, the House Science, Space and Technology Committee Staff, and the Senate Energy and Natural Resources Staff on their respective Center’s accomplishments and activities.
- All three Bioenergy Research Center (BRC) directors presented on the BRCs at a Congressional Staff Briefing with over 45 attendees from agencies including the National Science Foundation, the Department of Energy’s (DOE) Office of the Biomass Program and Office of Science and Technology Policy, as well as staff from house or senate offices or committees, and various media.
- BESC staff participated in “Tennessee Tuesday” with Senator Alexander (TN) and Senator Corker (TN) for an opportunity to discussion BESC and ORNL with the Senators and their aides.
- BESC maintained a presence in the Tennessee exhibition booth, with BESC brochures available in BESC partner state pavilions: Oklahoma, Colorado, California, Georgia, North Carolina, and Virginia.
- Paul Gilna participated in a TV and radio media event providing ~30 different media outlets with interviews on biofuels and the role biotechnology plays. Distributed airings were estimated to reach an audience of ~3,000,000.

Paul Hanson was highlighted in the May/June issue of ORNL’s Climate Change Science Institute (CCSI) Newsletter. See <http://www.climatechangescience.ornl.gov/> to learn more about the CCSI.

On July 1st four abstracts for presentations submitted by ORNL were accepted by the planning committee for the International Energy Agency (IEA) Joint Bioenergy Tasks 38/40/43 Workshop on "Quantifying and managing land use impacts of bioenergy."

Erin Webb has been named to the Biomass Research Development Initiative (BRDI) Interagency Working Group for logistics.

On July 5th, 12th, and 21st ORNL contributed to International Standards Organization (ISO) Project Committee 248 (Sustainable Criteria for Bioenergy) Work Group 4 webinars, developing a sub-report outline and content to help determine how to address food-fuel issues and direct versus indirect effects. Maggie Stevens took over as WG4 Secretary.

Creative Discovery Museum announces the addition of Wayne Robinson, Ph.D., Ed.S., as Biofuels Coordinator. The Creative Discovery Museum was selected by ORNL and University of Georgia's Education Department to develop and pilot science lessons on biofuels and alternative energy for transportation. Working with top scientists, engineers and science educators, the Museum created a classroom lesson called "Farming for Fuels," that is presented through the Museum's school outreach program, Museum-A-Go-Go. Robinson will lead the program that provides lessons by Museum outreach staff for Grades 4-7 on the scientific processes for creating biofuels from switchgrass rather than from corn. The Creative Discovery Museum is the only institution in the United States that has implemented a model biofuels curriculum for elementary age students. Read more about the Creative Discovery Museum at <http://www.cdmfun.org/page/press-area/press-releases/biofuels-workshop>.

On July 7th Keith Kline, Debo Oladosu, and Maggie Stevens participated in a conference call with Professor Goldemberg of the University of Sao Paulo's Instituto de Eletrotécnica e Energia to discuss potential collaborators on joint-research.

During July 10th-15th Natalie Griffiths presented research on "Biogeochemistry of forested watersheds in the Upper Coastal Plain of the Southeastern U.S. prior to conversion to short-rotation pine for bioenergy" at the Gordon Research conference on Catchment Sciences at Bates College, Lewiston, ME.

A number of Earth Observing System Data and Information System (EOSDIS) and Distributed Active Archive Center (DAAC) staff attended the second DataONE (Observation Network for Earth) User Group Meeting, held July 11th-12th in Santa Fe, NM. Topics included an overview of DataONE and input from the User Group on educational materials, data tools and services, preservation and data citations, and criteria for choosing new DataONE Member Nodes. Dawn Lowe and Andy Mitchell from EOSDIS, and Bob Downs (Center for International Earth Science Information Network - CIESEN); Patrick Denny (Alaska Satellite Facility - ASF); Siri Khalsa (National Snow and Ice Data Center - NSIDC); Chris Lenhardt, Giri Palanisamy, and Bob Cook (ORNL DAAC); Kevin Ward (Earth Observatory).

On July 11th-15th Suresh SanthanaVannan attended the Environmental Systems Research Institute (ESRI) International User Conference in San Diego, CA.

On July 12th Keith Kline, Maggie Stevens, Esther Parish, Lawrence Eaton, and Charles Garten participated in a conference call with representatives from the Brazilian Bioethanol Science and Technology Laboratory (CTBE) to discuss potential collaborations on joint-research and to identify a CTBE representative to serve as the point of contact for the composition and submission of a joint-proposal.

ORNL DAAC Manager, Chris Lenhardt, ORNL DAAC Deputy Manager, Tammy Beaty, ORNL DAAC Scientist, Bob Cook, and ORNL DAAC Developers, Giri Palanisamy, Jerry Pan, and

Ranjeet Devarakonda attended the July 12th–15th Earth Science Information Partners (ESIP) Federation Summer Meeting, Santa Fe, NM. DAAC Research Assistant, Reid Boehm also attended.

During June 15th to July 14th Jairo Lozano, a doctoral student at Ecole Polytechnique Fédérale de Lausanne (EPFL) Switzerland, visited Shahab Sokhansanj and his logistics group at the University of British Columbia (UBC). The objective of this visit was for Mr. Lozano to learn about the Integrated Biomass Supply and Logistics (IBSAL) model and ways of applying it to the collection and supply of sugar cane residue (green tops) and bagasse in Columbia cane industry for production of bioethanol. The project is conducted for the Columbian industry through Ecole Polytechnique under the supervision of Professor Edgard Gnanspounou.

On July 13th Virginia Dale met with Battelle, Columbus, OH (Jeff Wadsworth), and ACHIEVE (a non-profit organization created by the National Governors Association) to discuss developing a set of common core K-12 graduation standards that states would adopt.

BESC held the annual science review meeting in Chattanooga, TN, on July 18th - 21st. The retreat was attended by over 250 members of BESC, including researchers, post-docs, students, commercialization council members and industrial affiliates. ORNL participants displayed thirty-two posters and featured ten presenters highlighting BESC science in several categories including; formation & modification, deconstruction & conversion, characterization & modeling and education & outreach. Breakout and networking sessions concluded each days scheduled events providing more opportunity for interaction and collaboration among the members of BESC.

A Laboratory Information Management System (LIMS) workshop was held on July 20th, as part of annual BESC retreat this year. Co-chairs: Susan Holladay and Udaya Kalluri.

Dale Kaiser gave a global climate change presentation to middle school students taking part in Oak Ridge Associated Universities' (ORAU) 2011 Appalachian Regional Commission-ORNL Math-Science-Technology Summer Institute (<http://www.ornl.gov/arc-ornl/2011/default.html>) on July 18th. Students represented 13 states from within the Appalachian region. His presentation was titled "Climate Change, Global Warming, and Energy: The science and the issues are getting more and more complex. Or are they?" Lots of time both before and after the talk was devoted to a very interesting open group discussion. Many students were familiar with some of the global warming controversies played up in the past few years by the media. Dale's talk covered the most important climate change "basics" that are generally not controversial, and offered Intergovernmental Panel on Climate Change (IPCC)/DOE/National Oceanic and Atmospheric Administration (NOAA) scientific insight into other more complex issues. The takeaway message to students was "do your homework" - be well-informed stakeholders and consumers of climate change information by starting with information from real climate scientists, and use critical thinking in sorting through all that you read and hear on the subject.

Madhavi Martin gave an invited talk at the North American Symposium for Laser-induced Breakdown Spectroscopy (NASLIBS) conference held in Clear Water Beach, FL, July 18th-20th. The title of the presentation was "Laser-Induced Breakdown Spectroscopy for Nuclear Materials Analysis for in-situ Applications." On July 19th Madhavi Martin also participated as a panelist for a special panel discussion, "LIBS in the Courtroom: Recent Examples and Future Potential."

During July 18th-20th Esther Parish attended the American Meteorological Society's (AMS) 19th Conference on Applied Climatology/Practical Solutions for a Warming World AMS Conference

on Climate Adaptation joint conference in Asheville, NC. She presented a poster on “Dynamically downscaled simulations of the north Georgia flood of 2009 under different land-use scenarios” along with Willis Shem (first author) and Ben Preston of ORNL.

Stan Wullschleger was invited to participate in the DOE, Office of Science Graduate Fellowship Annual Research Meeting. The meeting was held at ORNL on July 19th and featured over 150 DOE graduate fellows from across the country that are conducting research in one of the six Research Offices under the DOE Office of Science. Stan's presentation was entitled "Global Change Biology and the Future of Climate Science: A Tale of Two Scales" and highlighted the use of advanced user facilities in support of climate-related missions of the Biological and Environmental Research (BER) program. Stan was introduced by Environmental Sciences Division (ESD) and Climate Change Science Institute (CCSI) postdoctoral associate Jeff Nichols.

The ORNL DAAC has released their Summer 2011 Newsletter. Check out their news and events at http://daac.ornl.gov/news/DAAC_newsletter_Summer11.pdf.

Jerry Pan, ORNL DAAC Developer, presented “Geoscience Data Curation Using A Digital Object Model and Open-Source Frameworks: Provenance Applications,” at the 2011 Institute of Electrical and Electronics Engineers (IEEE) International Geoscience and Remote Sensing Symposium, held July 23rd-29th, in Vancouver, Canada. This presentation is a product of the Earth Science Data in Digital Object Repository Architecture (ESDORA) project funded through a NASA Advancing Collaborative Connections for Earth System Science (ACCESS) grant.

A large delegation from ORNL participated in the International Conference on Mercury as a Global Pollutant, 2011, in Halifax, Nova Scotia, Canada, from July 24th-29th, presenting 14 talks and posters. Staff that participated in the meeting included Scott Brooks, Dwayne Elias, Baohua Gu, Alex Johs, David Kocman, Liyuan Liang, Carrie Miller, Jerry Parks, Jeremy Smith, and Teresa Mathews. This ORNL team also manned a DOE/ORNL booth, highlighting the mercury research programs at DOE and ORNL. Others that contributed to the presentations and posters include Beth Bailey, Craig Brandt, Steve Brown, Meghan Drake, Hao-Bo Guo, Feng He, Richard Hurt Jr., James Moberly, Tony Palumbo, Yun Qian, Demian Riccardi, Steve Tomanicek, Xiangping Yin, Wang Zheng, Kenneth Lowe, Brian Lester, Mark Peterson, Dave Watson and Eric Pierce.

A special session was organized by Liyuan Liang and Alex Johs, with Tamar Barkay (Rutgers University) and Paul Bayer (DOE-Biological and Environmental Research [BER]), on Molecular Mechanisms of Bacterial Methylation and Resistance. The session drew a large audience.

On July 25th ORNL submitted comments to the Office of the Biomass Program (OBP) on the State-DOE Global Bioenergy Partnership (GBEP) Proposal for Sustainable Bioenergy Capacity Building in less-developed nations.

University of Tennessee (UT) Ecology and Evolutionary Biology (EEB) graduate student, Melissa Cregger, was just awarded the 2011 Marvin L. Wesely Award from the DOE. This award was established in honor of the late Dr. Marvin L. Wesely, Argonne National Laboratory senior meteorologist and chief scientist of the DOE Atmospheric Chemistry Program, who died January 20, 2003, from heart cancer. The Marvin L. Wesely Fellowship is awarded to the Graduate Research Environmental Fellow (GREF) who has made the best use of their DOE mentor and facilities in improving the quality of his/her research efforts. The award is given for a one-year period to a current GREF fellow who has been supported to do global change research as part of the Global Change Education Program. Melissa is a Ph.D. student in Aimee Classen's lab - congratulations also to Aimee. Melissa is advised by Aimee Classen at UT, and Chris Schadt at

ORNL and Nate McDowell at Los Alamos National Laboratory (LANL) are her DOE Mentors.

ORNL DAAC was featured in the Highlighted Research section of the Oak Ridge Climate Change Science Institute (CCSI) Newsletter, May/June Volume 2, Issue 4, Page 4. The article explained ORNL DAAC's role in EOSDIS and featured work with the Mercury Consortium, Synthetic Aperture Radar (SAR) Subsets for Selected Field Sites, 2007-2010, and ORNL DAAC future involvement in Carbon in Arctic Reservoirs Vulnerability Experiment (CARVE), and Airborne Microwave Observatory of Subcanopy and Subsurface (AirMoss).

ORNL DAAC and ASF DAAC held a teleconference on July 26th to discuss the possibility of creating SAR subsets for additional field sites, as follow-on work to the 2010-2011 SAR Subsets Technology Infusion project. The completed SAR Subsets for Selected Field Sites, 2007-2010 data set contains 42 sites, and is accessible from the FLUXNET web site (<http://daac.ornl.gov/FLUXNET/fluxnet.shtml>) for sites with subsets and from the Spatial Data Access Tool. ASF and ORNL agreed to provide SAR subsets for additional field sites and for longer time periods in FY2011, in an attempt to make SAR data more accessible to ecologists.

During July 26th-27th several ORNL staff participated in "Biomass 2011" in Alexandria, MD, by giving presentations or posters. Laurence Eaton gave an invited talk on the Billion-ton Update report. ORNL had a significant presence in the Exhibitor Hall: the ORNL Booth with a focus on our sustainability research and interactive displays on feedstocks, our material science research, the Bioenergy KDF, and the Billion Ton update. The meeting was kicked off by talks by DOE Secretary Steven Chu, United States Department of Agriculture (USDA) Secretary Tom Vilsack, and U.S. Assistant Secretary of the Navy, Jackalynne Pfannenstiel. This meeting was attended by ~700 people and is one of the premier Bioenergy events of the year. Secretary Chu highlighted the upcoming release of the Billion Ton Update that ORNL has produced. Mark Downing, Tim Theiss, Robin Graham, Laurence Eaton, Aaron Myers, and Yun Wu attended.

Colleen Iversen was interviewed on Channel 10 News regarding her work with ORNL summer interns on the Free-Air CO₂ Enrichment (FACE) site. Read about their work and watch the interview at <http://www.wbir.com/news/article/177585/2/ORNL-interns-taking-advantage-of-chance-of-a-lifetime>.

On July 28th Steve Brown presented his talk, "The use of classical and systems biology tools to identify genes that overcome biocatalyst inhibition," at the Society for Industrial Microbiology (SIM) Annual Meeting and Exhibition in New Orleans, LA. Check out details on his talk online at <http://sim.confex.com/sim/2011/webprogram/Paper20013.html>.

On July 29th Keith Kline and Virginia Dale participated in a Council on Sustainable Biomass Production (CSBP) Forestry Task Force conference call during which life cycle assessment approaches were discussed.

ORNL DAAC is compiling a master list of terrestrial ecology field sites from around the world. The sites include flux tower sites, biological field stations, climate reference network sites, etc. The purpose of this master list is to enable ecologists and modelers to obtain site-specific data readily. In addition, the ORNL DAAC will provide subsets of Moderate Resolution Imaging Spectroradiometer (MODIS) and other sensor land products at these field sites. Currently, field site coordinates for ~50 networks are being compiled. Contacts for individual networks have been emailed to obtain the most up-to-date and precise coordinates, where available. The updated

coordinates will be used in the next version of the MODIS subsetting activity and in other site-specific data bundling activities.

On July 29th Keith Kline and Gangsheng Wang contributed comments in the 6th Webinar of International Organization for Standardization (ISO) PC248 (Sustainable Criteria for Bioenergy) Work Group 2 on Greenhouse Gas Emissions and provided input for the overall draft Standard to WG1 (definitions and cross-cutting issues).

BESD New Arrivals

Jianjun (Jim) Guo joined the Plant Systems Biology Group in the Biosciences Division (BSD) on July 19th as a postdoctoral research associate. Jim received his Ph.D. degree from University of British Columbia in Canada in 2010. Prior to joining BSD through the ORNL Advanced Short-Term Research Opportunity Program (ASTRO), Jim worked as a Postdoctoral Research Fellow at Harvard University. Jim has extensive research experience and expertise in plant molecular biology and molecular genetics, and will work with Jay Chen and Jerry Tuskan to characterize regulators of biomass recalcitrance selected from the Populus activation tagging study and association mapping. Jim's research at ORNL is also supported by the Natural Sciences and Engineering Research Council of Canada (NSERC) Postdoctoral Fellowships Program.

Seung-Yong Jung arrived in July to work as a postdoctoral research associate with Bob Standaert. Seung-Yong will develop a novel infrared spectrometer for analysis of organic and biological materials that includes design of the optical layout, assembly of components, design and fabrication of sample holders and cells, and collection and analysis of data.

Meg Steinweg arrived in July to work as a postdoctoral research associate with Chris Schadt. Meg will apply, utilize, and develop novel methods toward understanding how microbial communities contribute to changes in carbon cycling in bogs and other terrestrial ecosystems, and how these processes and communities may effect, or be effected by climate change scenarios using experimental warming technologies. These studies will be accomplished using techniques such as enzyme potential assays, quantitative polymerase chain reaction (PCR) and deoxyribonucleic acid (DNA) pyrosequence analysis on both field samples and laboratory incubation experiments.